

## **Transition of NDE Related Technology to Planetary Telerobotic Mechanisms at JPL**

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*Non-destructive evaluation*

### **ABSTRACT**

Jet Propulsion Laboratory is responsible for the NASA unmanned deep space exploration programs. Under this responsibility, JPL is using various types of waves including microwave, radar, radio, and infrared to investigate distant planets. Besides remote imaging, JPL is increasingly conducting in-situ planetary exploration where miniature, miser, light and inexpensive telerobotic mechanisms are used to perform sampling and analysis tasks. The tasks are involved with harsh conditions, which are challenging the limits of existing technologies. The need for effective actuators and planetary sampling tools has been the subject of R&D at the JPL NDEAA Group. The NDEAA scientists used their extensive experience and know-how in plate waves and piezoelectricity to develop a series of new devices and innovative mechanisms. This effort involves cooperation with scientists and engineers at such organizations as NASA Centers, universities, research institutes and industry. The developed mechanisms and devices include ultrasonic motors and piezoelectric pumps that are driven by traveling flexural waves. An ultrasonic driller and corer is being developed that is driven by a piezoelectric actuator and its potential applicability at temperatures as high as 500°C is making attracting to such planets exploration as Venus. In parallel, electroactive polymers are being investigated for use as actuators that act similar to muscles. A dust wiper was developed that operates similar to a windshield wiper of an automobile and was selected as a baseline technology for a mission to an asteroid that will be launched in 2002. These devices and mechanisms as well as emerging medical applications that are being developed at the JPL's NDEAA Group will be reviewed in this presentation.